

Ecological site R087BY002TX

Claypan Savannah

Last updated: 9/21/2023

Accessed: 09/11/2026

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 087B–Texas Claypan Area, Northern Part

This area is in northeastern Texas (79 percent) and southeastern Oklahoma (21 percent). It makes up about 4,480 square miles (11,610 square kilometers). The towns of Greenville, Sulphur Springs, Paris, Mount Vernon, Canton, and Athens, Texas, and Durant, Oklahoma, are in this MLRA. Interstates 30 and 20 and Highways 69, 70, 80, and 82 cross the area. The Caddo National Grasslands is in the north end of the area.

Classification relationships

USDA-Natural Resources Conservation Service, 2006. -Major Land Resource Area (MLRA) 87B

Ecological site concept

The Claypan Savannah ecological site is characterized by a fine sandy loam or loam surface soil underlain by a dense clay subsoil. This is also the typifying site to which the MLRA derived its name. The clay subsoil impacts water movement through the soil, which often perches water.

Associated sites

R087BY004TX	Sandy
R087BY005TX	Deep Sand
R087BY007TX	Loamy Bottomland
R087BY001TX	Depression
R087BY003TX	Sandy Loam
R087BY002TX	Claypan Savannah

Similar sites

R087AY003TX	Claypan Savannah
-------------	------------------

Table 1. Dominant plant species

Tree	(1) <i>Quercus stellata</i> (2) <i>Quercus marilandica</i>
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Sorghastrum nutans</i>

Physiographic features

This site occurs as nearly level to sloping uplands. Slopes range from 0 to 20 percent, but are generally 1 to 8 percent. The soils are underlain by a dense clay subsoil and during large precipitation events, the sites can briefly pond water. This is more common if the sites are associated with depression and flood plain areas. Some sites will have a high water table, which is generally highest in late winter and early spring.

Table 2. Representative physiographic features

Landforms	(1) Plains > Interfluve (2) Plains > Ridge
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None
Elevation	80 – 230 m
Slope	0 – 10 %
Water table depth	200 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Negligible to very high
--------------	-------------------------

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0 – 20 %
Water table depth	Not specified

Climatic features

The average annual precipitation is 47 inches in most of this area, but it can be higher or lower depending on the exact location. Most of the rainfall occurs in spring and winter. The average annual temperature is 62 to 66 degrees F. The freeze-free period averages 235 days and frost-free period averages 210 days.

Table 4 Representative climatic features

Frost-free period (average)	210 days
Freeze-free period (average)	240 days
Precipitation total (average)	1,190 mm

- (1) BOSWELL 1 S [USC00340980], Boswell, OK
- (2) CLARKSVILLE 2NE [USC00411772], Clarksville, TX
- (3) EMORY [USC00412902], Emory, TX
- (4) DURANT [USC00342678], Durant, OK
- (5) MT PLEASANT [USC00416108], Mount Pleasant, TX
- (6) MT VERNON [USC00416119], Mount Vernon, TX
- (7) LAKE FORK RSVR [USC00414976], Quitman, TX
- (8) PARIS [USC00416794], Paris, TX
- (9) BONHAM 3NNE [USC00410923], Bonham, TX
- (10) DENISON DAM [USC00412394], Cartwright, TX

Influencing water features

The site can have a high water table. Water tables are most common in the late winter and early spring, or anytime the soil is saturated from large precipitation events.

Wetland description

A stream or wetland does not influence the plant community of this site.

Soil features

The soils are deep to very deep and have fine sandy loam or loamy surfaces over dense clay subsoils. The topsoil ranges from 6 to 15 inches deep but averages less than 10 inches. The surface soil takes in water readily but the clay subsoil is very slowly permeable and restricts air movement and root growth. The very slow permeability and shallow topsoil cause the site to be wet in the winter, slow to warm in the spring, and droughty during the growing season. Low to moderate fertility somewhat limits production on this site. Under

good management where herbaceous cover and litter are maintained, rills, gullies, pedestals, and soil compaction layers are not present on the site. Soils correlated to this site include: Annona, Bazette, Boxville, Bryarly, Crockett, Karma, Raino, Whakana, and Woodtell.

Table 5. Representative soil features

Parent material	(1) Residuum – shale
Surface texture	(1) Loam (2) Fine sandy loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Very rapid
Soil depth	110 – 200 cm
Surface fragment cover ≤3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	4.5 – 8.4

Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The Claypan Savannah ecological site evolved and was maintained by the grazing and herding effects of native wild large ungulates, periodic fires, and climatic fluctuations. Conversion of this site to cropland and the subsequent abandonment of cropping removed the natural native vegetation, organic matter, fertility, and allowed woody species to invade the site. Continuous grazing by domestic livestock and the suppression of fire on non-cropland sites removes little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), Engelmann's daisy (*Engelmannia peristenia*), yellow neptunia (*Neptunia lutea*), and gayfeather (*Liatris elegans*). Less productive perennial and annual grasses, forbs, vines, and shrubs will replace these plants. With continued continuous grazing, no brush management, and the absence of periodic fires, a community dominated by winged elm (*Ulmus alata*), eastern persimmon (*Diospyros virginiana*), mesquite (*Prosopis glandulosa*), yaupon (*Ilex vomitoria*), post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), and eastern red cedar (*Juniperus virginiana*) will replace the savannah.

State and transition model

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 9. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Animal community

The historic savannah provided habitat to bison, deer, turkey, migratory birds and large predators such as wolves, coyotes, mountain lions, and black bear. White-tailed deer, turkey, coyotes, bobcats, and resident and migratory birds find suitable habitat in these savannahs today. Domestic livestock and exotic ungulates are the dominant grazers and browsers of this site. As the savannah transitions through the various vegetative states towards the woodlands, the quality of the habitat may improve for some species and decline for others. Management must be applied to maintain a vegetative state in optimum habitat quality for the desired animal species.

Hydrological functions

Peak rainfall periods occur in May and June from frontal passage thunderstorms and in September and October from tropical systems as well as frontal passages . Rainfall amounts may be high (three to five inches per event) and events may become intense. The site is subject to erosion where adequate herbaceous cover is not maintained and on heavy use areas such as roads and livestock trails. Gullies feeding into streams and drains are common on this site where adequate herbaceous cover has not been maintained. Extended periods (60 days) of little to no rainfall during the growing season are common. The hydrology of this site may be manipulated through management to yield higher runoff volumes or greater infiltration to groundwater. Management for less herbaceous cover will favor higher surface runoff while dense herbaceous cover will favor ground water recharge. Potential pollution from sediment, pesticides, and both organic and inorganic fertilizers should always be considered when managing for higher volumes of surface runoff.

Recreational uses

Hunting, camping, bird watching, equestrian, and photography are common activities.

Wood products

Oaks are used for firewood. Hickory and mesquite are used for barbecue wood. Yaupon is used for landscaping.

Other products

Fruit from dewberries, grapes, and plums are harvested.

Inventory data references

These site descriptions were developed as part a Provisional Ecological Site project using historic soil survey manuscripts, available site descriptions, and low intensity field traverse sampling. Future work to validate the information is needed. This will include field activities to collect low, medium, and high-intensity sampling, soil correlations, and analysis of that data. A final field review, peer review, quality control, and quality assurance review of the will be needed to produce the final document.

Other references

1. Archer, S. 1994. Woody plant encroachment into southwestern grasslands and savannas: rates, patterns and proximate causes. In: Ecological implications of livestock herbivory in the West, pp. 13-68. Edited by M. Vavra, W. Laycock, R. Pieper. Society for Range Management Publication, Denver, CO.
2. Archer, S. and F.E. Smeins. 1991. Ecosystem-level Processes. Chapter 5 in: Grazing Management: An Ecological Perspective. Edited by R.K. Heitschmidt and J.W. Stuth. Timber Press, Portland, OR.
3. Bestelmeyer, B.T., J.R. Brown, K.M. Havstad, R. Alexander, G. Chavez, and J.E. Herrick. 2003. Development and use of state-and-transition models for rangelands. J. Range Manage. 56(2): 114-126.
4. Brown, J.R. and S. Archer. 1999. Shrub invasion of grassland: recruitment is continuous and not regulated by herbaceous biomass or density. Ecology 80(7): 2385-2396.
5. Foster, J.H. 1917. Pre-settlement fire frequency regions of the United States: a first approximation. Tall Timbers Fire Ecology Conference Proceedings No. 20.
6. Gould, F.W. 1975. The Grasses of Texas. Texas A&M University Press, College Station, TX. 653p.
7. Hamilton, W. and D. Ueckert. 2005. Rangeland Woody Plant Control: Past, Present, and Future. Chapter 1 in: Brush Management: Past, Present, and Future. pp. 3-16. Texas A&M University Press.
8. Scifres, C.J. and W.T. Hamilton. 1993. Prescribed Burning for Brush Management: The South Texas Example. Texas A&M University Press, College Station, TX. 245 p.
9. Smeins, F., S. Fuhlendorf, and C. Taylor, Jr. 1997. Environmental and Land Use Changes: A Long Term Perspective. Chapter 1 in: Juniper Symposium 1997, pp. 1-21. Texas Agricultural Experiment Station.
10. Stringham, T.K., W.C. Krueger, and P.L. Shaver. 2001. State and transition modeling: and ecological process approach. J. Range Manage. 56(2):106-113.
11. Texas Agriculture Experiment Station. 2007. Benny Simpson's Texas Native Trees (<http://aggie-horticulture.tamu.edu/ornamentals/natives/>).
12. Texas A&M Research and Extension Center. 2000. Native Plants of South Texas (<http://uvalde.tamu.edu/herbarium/index.html>).
13. Thurow, T.L. 1991. Hydrology and Erosion. Chapter 6 in: Grazing Management: An Ecological Perspective. Edited by R.K. Heitschmidt and J.W. Stuth. Timber Press, Portland, OR.
14. USDA/NRCS Soil Survey Manuals counties within MLRA 8BA.
15. USDA, NRCS. 1997. National Range and Pasture Handbook.
16. USDA, NRCS. 2007. The PLANTS Database (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
17. Vines, R.A. 1984. Trees of Central Texas. University of Texas Press, Austin, TX.
18. Vines, R.A. 1977. Trees of Eastern Texas. University of Texas Press, Austin, TX. 538 p.
19. Wright, H.A. and A.W. Bailey. 1982. Fire Ecology: United States and Southern Canada. John Wiley & Sons, Inc.

Contributors

Mike Stellbaur
Tyson Hart

Approval

Bryan Christensen, 9/21/2023

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	09/11/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):

5. Number of gullies and erosion associated with gullies:

6. Extent of wind scoured, blowouts and/or depositional areas:

7. Amount of litter movement (describe size and distance expected to travel):

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):

12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant:

Sub-dominant:

Other:

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):

14. Average percent litter cover (%) and depth (in):

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):

16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

17. Perennial plant reproductive capability:
